THE ROLE OF CONSORTIA STANDARDS IN FEDERAL GOVERNMENT PROCUREMENTS IN THE INFORMATION TECHNOLOGY SECTOR: TOWARDS A RE-DEFINITION OF A VOLUNTARY CONSENSUS STANDARDS ORGANIZATION

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EXECUTIVE SUMMARY:

I. Standardization is an essential and growing element in the success of the Information Technology industry. The success of the Internet, the World Wide Web, e-Commerce, and the incipient wireless revolution are all predicated upon successful standardization. A majority of the standards that drive these evolving areas of technology are created in consortia, a form of standardization organization that falls outside the standardization regime prescribed by the American National Standards Institute (ANSI).

II. A definition of both "Information Process" and "consortia" is provided to limit the scope of this change to a precise set of problems.

III. The laws that govern procurement for Federal agencies within the Information Technology sector are written and interpreted in a fashion such that consortia specifications are excluded from consideration unless the procuring agency requests a waiver from the OMB to permit use of a "non-standard" specification.

IV. An amendment to the Section 12(d) of Public Law 104-113, the ``National Technology Transfer and Advancement Act of 1995" can be used to redefine a "Voluntary consensus standards bodies" within the IT sector in order to allow agencies to select from a more complete and realistic set of offerings than can be offered under the current law.

THESIS OF THE PAPER

Standardization is essential to the growth of the IT industry. Within the IT industry, well-developed consensus consortia standards should be placed on an equal footing with standards developed by ANSI accredited organizations. The current Federal procurement practices - as mandated by OMB A-119 - discourage the use of consortia specifications. The paper concludes with a proposal for a legislative change to permit and encourage Federal use of consortia-created standards in procurement.

SECTION I: THE EVOLUTION AND ROLE OF STANDARDIZATION IN THE INFORMATION TECHNOLOGY INDUSTRY

Standardization is an essential element to the growth of the computer industry. Most new Information Technology (IT) industry initiatives center around the concept of interoperability, one of the fundamental goals of IT standardization (and most standardization, for that matter.) There are no more "homogeneous islands of computing" which marked the late 1980s; today's environment is worldwide, fast paced, and completely heterogeneous. The impact of this changing environment on business, society, and culture cannot be overstated. Just as the common gauge for railroads changed the face of the United States in the last half of the 1800's, the creation and growth of the standards-based digital economy will have a profound effect on the nature and future of life in the United States. Nearly a decade ago, The Economist published the following in its Survey of Information Technology:

> "The noisiest of those competitive battles (between suppliers) will be about standards. The eyes of most sane people tend to glaze over at the very mention of technical standards. But in the computer industry, new standards can be the source of enormous wealth, or the death of corporate empires. With so much at stake, standards arouse violent passions."[1]

This statement - echoed in one form or another in most literature on the subject of standardization - is even more applicable today in the IT industry. With the advent of the Internet and the World Wide Web (WWW), open standards[2] are becoming more and more a part of the "infratechnologies"[3], a term used by NIST to describe a superset of technologies (the technological infrastructure) which "…provide the technical basis for industry standards"[4]. As Martin Libicki of RAND notes, "(w)ith each passing month, the digital economy grows stronger and more attractive. Much, perhaps, most of this economy rests upon the Internet and its World Wide Web. They, in turn, rest upon information technology standards".[5]

This fundamental change in the focus of information technology (from one of homogeneous computing to one of interoperable information sharing) has had a significant impact on the standardization activities of the IT industry. The initial standardization organizations were those that operated under the rules and organizational constricts of the American National Standards Institute (ANSI), following in the footsteps of all the other industrial standardization activities in the United States. This was during the period that much of the fundamental hardware standardization activities were occurring - from common interconnections for the keyboard and mouse to printers and storage systems. The negotiations that created these standards - which were complex and confined to a relative handful of providers - were usually under the aegis of one or two standardization committees in the United States[6]. They usually dealt with things that would stay standardized for a long time. The formal national bodies under the aegis of ANSI in the U.S., and the

international bodies under the International Organization for Standardization and the International Electrotechnical Commission (ISO and IEC) were referred to as Standards Developing Organizations (SDOs) and were the source of standardization for the IT industry.

However, in the later 1980s, a different form of standardization activity appeared, beginning with an organization called "X/Open".[7] Providers began to move technology standardization away from the formal ANSI and ISO recognized SDOs to those of consortia, which did not have the intricate processes of the SDOs. The formal processes, which were both time consuming and often Byzantine, were necessary because "[m]ost delegates represent[ed] personal, professional, national, disciplinary, and industry goals…"[8], and managing this vast and sometimes contradictory set of expectations forced these groups to create intricate rules to make sure that all voices were heard. Consortia, on the other hand, because they usually consisted of groups of like minded participants (either for technical or market reasons), did not need to have the lengthy discussions over the mission and intent of the proposed standardization activity - an organization's presence was, in many cases, proof of a general agreement.[9] The archetypal consortium was the Internet Engineering Task Force (IETF), the group that manages the Internet. The success of this group in both keeping the Internet a leading-edge technical architecture leader as well as clear of greed, parochialism, and lethargy is a significant accomplishment.[10]

This shift was amplified by the introduction and ensuing popularity of the World Wide Web in the early 1990s. The establishment of the World Wide Web Consortium (W3C)[11] in October 1994 was a turning point within the IT industry; after this date, consortia were the logical place to develop joint specifications, while before they had been the "alternative place". The generation of IT practitioners who are now leading much IT development, which is largely focused on Internet technologies, do not have an awareness of ANSI and ISO as sources for standards. Their world is largely bounded by consortia such as W3C and the IETF. They see no need for ANSI or ISO standardization - a message that they carry to their companies.[12] With the maturity of the Web, an increasing number of consortia are being created to standardize Web based technology. (Nearly all e-Commerce organizations develop their specifications in arenas that are either consortia or consortia-like.)

The reason for the use of consortia lays not so much in the speed of technical development, but rather in the willingness of the consortia to use expedited processes. The IETF has been using the Internet to communicate among interested parties, post specifications, achieve rough consensus on technical features and functions, and then move forward on standardization. The specifications that the IETF adopts are usually based upon extant practice, with at least two implementations required for specifications on the standards track, and are available for widespread public review and comment. This practice - using its own technology to permit faster standardization of follow-on technology - is another step that sets the IETF

apart from its contemporary organizations of the 1980s. The use of its technologies as a basis for its standardization practices ensures workable and implementable specifications, but more importantly allows the IETF to develop into a truly international organization. When the specification is complete, it is posted on the IETF web site with free access for all.

The W3C operates in a similar, though somewhat more formal, manner. W3C is a good model for the operation of many other consortia. These consortia realize the key elements are speed and accessibility - accessibility to those who are concerned about their work. As The Economist has pointed out, "…the Internet has turned out to be a formidable promoter of open standards that actually work, for two reasons. First, the web is the ideal medium for creating standards; it allows groups to collaborate at almost no cost, and makes the decision-making more transparent. Second, the ubiquitous network ensures that standards spread much faster. Moreover, the Internet has spawned institutions, such as the Internet Engineering Task Force (IETF) and the World Wide Web Consortium (W3C), which have shown that it is possible to develop robust common technical rules."[13] These features have made the IT community turn to consortia and similar structures for their standardization needs, in both hardware and software. The creation of highly open, highly visible specifications - widespread in their adoption and use - is essential to the continuing evolution of the IT sector and IT industry.

Another aspect of consortia that separates them from the traditional SDOs is their dependence upon the market, rather than institutions, for relevance. A consortium succeeds or fails by its ability to attract members to accomplish its technical agenda. It receives little or no funding other than what its membership is willing to pay; money received from the government is rare, and is usually in return for some exact service that the consortium renders to a specific government agency in the role of a contractor.[14] While this dependence upon its members for financing can be seen as a limitation on the consortium's freedom of action, it reflects the state of the market in formal SDOs as well, except that formal SDOs do not shut down if all of the commercially important members (those who would implement the specification) walk away. There is a delicate balance between an independence that leads to an unused standard and a financial dependency that produces a constrained specification.

SECTION II: DEFINITION OF THE INFORMATION TECHNOLOGY

Within the scope of this paper, the term Information Technology shall be the same as the definition found in "The United States Code, Title 40, Chapter 25--Information Technology Management, Section 1401.Definitions, (3) (A) and (B), to include "…any equipment or interconnected system or subsystem of equipment, that is used in the automatic acquisition, storage, manipulation, management, movement,

control, display, switching, interchange, transmission, or reception of data or information by the executive agency. For purposes of the preceding sentence, equipment is used by an executive agency if the equipment is used by the executive agency directly or is used by a contractor under a contract with the executive agency which (i) requires the use of such equipment, or (ii) requires the use, to a significant extent, of such equipment in the performance of a service or the furnishing of a product.

(B) The term ``information technology'' includes computers, ancillary equipment, software, firmware and similar procedures, services (including support services), and related resources."

SECTION III: DEFINITION OF A CONSORTIUM

The definition of a "consortium" used in this submission derives from several taxonomies developed in the previous decade, all of which were focused on the Information Technology sector. Weiss and Cargill (1992) identified three separate types that focused on implementation, application, and proof-of-technology[15]; Updegrove (1995) identified research consortia, specification groups, and strategic consortia[16], while Ketchell (2001) identified specification creating consortia and "fora" (consortia whose function was to define user and market requirements for further technical development)[17]. The three taxonomies share enough common definitional concepts to constitute a basis for development of a model for this paper.

Of the varieties of consortia enumerated, only two general types meet the requirements of the proposal to modify the Federal procurement process. Both of these types share a common characteristic - the creation of specifications from which products can be developed and implemented in the larger industry. The first type can be identified as a group that is focused on creating a specification that acts to bridge a gap left by other standards or which fills a small niche market. These groups are "…often formed to develop a standard to fill an important niche-industry technical gap that is not large enough to merit the attention of an industry standard setting body…"[18]. These groups include consortia such as the 10 Gigabit Ethernet Alliance, Frame Relay Forum, the Small Form Factor Committee, and the WEB3D Consortium, all of which are focused on creating specifications that address a niche problem or small portion of a larger problem. These consortia are usually small and very focused in the solutions they provide - typically producing robust and implementable specifications in a short time. The players in these groups are usually organizations, which have an interest (product or service offering) that relies upon completion and wide acceptance of a specification. This type of consortia is especially widespread among providers of hardware interfaces and point software solutions. They are characterized by a relatively restricted field of application, and tend to be short lived. The work that they do is published and implemented in products relatively quickly, where it either will gain adherents and survive or will find no market and disappear.

The other type of consortia, which Updegrove labels "strategic", deal with systems, architectures, or new emerging markets where there is a need for a large number of interrelated and/or continuous specifications. These consortia, typified by W3C, the IETF, and The Object Management Group, are usually larger, concerned with a broad spectrum of specifications, and tend to be more long lived. Many of the consortia in this space are attempting to create, grow, and stabilize a market. They also have a more diverse membership, often making consensus harder to attain. As they succeed in obtaining consensus and in moving forward, however, their results can be impressive and cause a major shift, sometimes revolutionary, in the IT arena.

As noted above, both types of consortia share a common attribute - the creation of specifications from which products or services can be developed and sold. The first and primary requirement of consortia, as they are defined for the purposes of this proposal, is they must create useable specifications. This leads to a description of other attributes that a consortium must have.[19] Appendix A, Section 2, provides an overview of consortia, their rationale, and practice. However, as Updegrove notes "Effective, efficient, and representative evolution of standards by consortia is impossible without an appropriate structure of administration and technical decision making. When the authors law firm first began representing consortia, it performed a wide examination of possible forms under various jurisdictions, and settled eventually on the Delaware not-for-profit, non-stock membership corporation…. This structure has stood up extremely well in practice."[20]

This then, would appear to be a potential second criterion by which a consortium may be judged. In the case of a non-U.S. consortium, however, such a ruling would be inappropriate. What may be sought, however, is a structure that indicates some form of reality in law - something that would indicate that there is a legal basis under which the consortium operates and which subjects it to some form of governmental oversight. The intent is to ensure that the consortium is serious by its commitment to achieve legal standing.

"The heart and soul of any consortium may be found in a humble home: its bylaws and charter. Although a few important rules may come to rest in a membership application, most of the regulations and rights of the organization will be found in these legal documents. Whether or not they are carefully conceived will determine whether or not the organization is easily managed, whether it incurs needless exposure to its members under antitrust laws, whether its members feel themselves fairly represented and therefore renew their membership, and whether or not the organization is sufficiently flexible to evolve and flourish."[21] This is another important criterion - the organization must have a set of governing rules that explain how the consortium works, how its members are treated, and the rights and responsibilities of the members. Definition of how the consortium creates its technical specifications - including the methodologies of the

creating committees - should also be present. While it is acceptable to have various levels of membership, the criteria for gaining these levels must be clear and unambiguous. There is also the necessity to ensure that there is no exclusivity on joining the consortium; anyone meeting the requisite entry requirements must be allowed to join and participate under the same terms and conditions as other members.

Examination of the intellectual property (IP) regime of the consortium is also necessary. The consortium must have clear IP Rules (IPR) no less rigorous than those of the ISO - since most consortia operate in the international arena. ISO patent policy[22] mandates, as a minimum, commitment to reasonable and non-discriminatory (RAND) licensing by participants. How RAND is implemented is a matter left to the organization, as are any other rules governing IPR. However, the rules must be complete, spelling out the requirements of members, the penalties for non-compliance, and remedies available to members for such non-compliance. Basically, there must be clear assurance that the holder of IPR will not attempt to treat other consortia participants and users of the standard unfairly.

With respect to participation, ANSI-accredited SDOs cite "balance of participation" (parity between the various affected parties, usually providers, users, and others) as one of the criteria for judging whether an organization is legitimate. By definition, a consortium tends to be biased towards those who are interested enough to "pay to play", which may be enough to violate the ANSI rule of balance. What must be assured is that no party is denied the right to participate based upon the nature of the would-be participant, unless the participant is unwilling or unable to meet the common entrance requirements of the consortium.

The key to judging the "openness of the consortia" is one of the major differentiators between the consortia and the SDO forms of standardization. Openness has traditionally been viewed as the willingness to admit all concerned parties to the table. Consortia typically do not do this. Only consortium members may be allowed at the table to discuss specifications. This is why the members are willing to pay - they are trading money or other resources for the ability to determine the specification. This is not substantially different than the SDOs, where participants trade resources (time and travel budget) for the right to participate. Both groups traditionally charge fees - the difference is the amount of the fee charged. Therefore, it is necessary to create new criteria for "openness" among consortia.

The primary test for openness should be the outcome of the consortia – (1) the specification should provide an open (RAND minimum) reference implementation, (2) two or more competing implementations should exist, and (3) there should be, if appropriate, a testing regime to ensure interoperability among the various implementations.[23] This approach focuses on the rationale for standardization - that is, there should be a mechanism by which the users have a choice of implementations from which to choose, providing guaranteed alternative sources for critical products.

In summary, the criteria for a "good" consortium, for the purposes of this paper, includes:

1. The consortium must develop technical specifications.
2. The consortium must be some type of legal entity.
3. The consortium must have a well-defined, legally acceptable set of procedures and processes.
4. The consortium must have a clear and legitimate IPR policy that requires, at a minimum, RAND licensing of all IPR included in its specifications.
5. The membership of the consortium must not be arbitrarily restricted. The consortium must not restrict participation based on non-economic criteria (e.g. competitors, organizational origin, or purpose for joining).
6. There should be reference implementations, competing implementations, and test methods to validate conformance as appropriate.

SECTION IV: THE ROLE OF NATIONAL POLICY WITH RESPECT TO THE IT SECTOR

In a major Congressional Office of Technology Assessment (OTA) study completed early in the 1990's, the following comment commands attention:

> "Other goods, like education and standards, are impure public goods. These combine aspects of both public and private goods. Although they serve a private function, there are also public benefits associated with them. Impure public goods may be produced and distributed in the market or collectively through government. ***How they are produced is a societal choice of significant consequence.*** "[24] [Emphasis added]

The major contention of this paper is that current legislation regarding governmental procurement is weighted in favor of the SDOs and does not encourage consideration of the production of standards and specifications produced by consortia - except in special circumstances.

The basic law covering Federal Procurement with respect to standardization is Public Law 104-113, the "National Technology Transfer and Advancement Act of 1995".[25] The applicable section of PL 104-113 is "Section 12 (d) Utilization of Consensus Technical Standards by Federal Agencies; Reports", passed by the Congress in order to establish the policies of the existing OMB Circular A-119 in law. The first subsection, 12 (d) (1), states:

> "In general. --Except as provided in paragraph (3) of this subsection, all Federal agencies and departments shall use technical standards that are ***developed or adopted by voluntary consensus standards bodies*** (emphasis added), using such technical standards as a means to carry out policy objectives or activities determined by the agencies and departments."

This section sets the intent and establishes specific guidance to the National Institute for Standards and Technology (NIST) to ensure that the Federal agencies and departments are not creating their own standards, but are using commercially developed standards to carry out their missions. Sections (2) offers guidance on the participation in or the joining of a standards organization, and section (3) provides an exception clause, through which agencies can explain why they have chosen not to use commercial standards. Section (4) provides a definition of standards as:" the term `technical standards' means performance-based or design-specific technical specifications and related management systems".

The determination of what is a "voluntary consensus standards body" has been left to OMB. In OMB Circular A119, we find the following explication:

> 4. What Are Voluntary, Consensus Standards?
>
> a. For purposes of this policy, voluntary consensus standards are standards developed or adopted by voluntary consensus standards bodies, both domestic and international. These standards include provisions requiring that owners of relevant intellectual property have agreed to make that intellectual property available on a non-discriminatory, royalty-free or reasonable royalty basis to all interested parties. For purposes of this Circular, ``technical standards that are developed or adopted by voluntary consensus standard bodies" is an equivalent term.
>
> (1) Voluntary consensus standards bodies are domestic or international organizations which plan, develop, establish, or coordinate voluntary consensus standards using agreed-upon procedures. For purposes of this Circular, "voluntary, private sector, consensus standards bodies," as cited in Act, is an equivalent term. The Act and the Circular encourage the participation of federal representatives in these bodies to increase the likelihood that the standards they develop will meet both public and private sector needs. A voluntary consensus standards body is defined by the following attributes:
>
> (i) Openness.
>
> (ii) Balance of interest.
>
> (iii) Due process.
>
> (vi) An appeals process.
>
> (v) Consensus, which is defined as general agreement, but not necessarily unanimity, and includes a process for attempting to resolve objections by interested parties, as long as all comments have been fairly considered, each objector is advised of the disposition of his or her objection(s) and the reasons why, and the consensus body members are given an opportunity to change their votes after reviewing the comments.
>
> b. Other types of standards, which are distinct from voluntary consensus standards, are the following:

(1) "Non-consensus standards, "Industry standards," "Company standards," or "de facto standards," which are developed in the private sector but not in the full consensus process.

(2) ``Government-unique standards,'' which are developed by the government for its own uses.

(3) Standards mandated by law, such as those contained in the United States Pharmacopeia and the National Formulary, as referenced in 21 U.S.C. 351.[26]

This definition - specifically with the requirement for "(ii) Balance of interest"[27] would appear to limit standards to formal (non-consortia) standardization, since, by definition, the participants in a consortium are self-selecting for a particular technology specification. At the same time, consortia standards do not fall under the conditions set forth in Section 4.b.(1), as they are developed in full consensus and then are actually implemented by the industry. Section 4.b.(1) seems to speak to "proprietary standards", which are usually implementation standards - that is, standards based upon a single vendor's implementation, and usually described as "de facto" standards.

In section 6 g., however, we read:

" Does this policy establish a preference between consensus and non-consensus standards that are developed in the private sector?

This policy does not establish a preference among standards developed in the private sector. Specifically, agencies that promulgate regulations referencing non-consensus standards developed in the private sector are not required to report on these actions, and agencies that procure products or services based on non-consensus standards are not required to report on such procurements. For example, this policy allows agencies to select a non-consensus standard developed in the private sector as a means of establishing testing methods in a regulation and to choose among commercial-off-the-shelf products, regardless of whether the underlying standards are developed by voluntary consensus standards bodies or not."[28]

This section, by reading in light of the previously examined sections, seems to state that "proprietary standards" or "de facto standards" are permissible, meaning that the use of consortia based standards, which are open, consensus driven, and lack only the "balance" described in 4.a.(1)(ii) are the equivalent of proprietary or *de facto* standards, which they are not. Consortia standards represent standards that have been developed in an atmosphere that is as rigorous - if not more so - than most SDO standards, yet it is deprecated because it does not meet the five voluntary criteria.

The intent of A119appears to be clear - standards developed in an open process are preferable to those that are not. Yet, because of the definition of a voluntary consensus standard contained in Section 4, the use of consortia developed standards is specifically disallowed, while standards developed in proprietary

environments, or standards that are derived from a product (implementation standard), are permitted (Section 6.g.).

In a larger sense, however, for the IT sector the exclusion of consortia developed standards in Section 4.a. is flawed. A majority of standards that are driving the next generation of computing - specifically, those from the IETF (the standards of the Internet), those of the W3C (the standards of the Web and of e-Commerce), the wireless phone standards (those created by the WAP Forum and by ETSI), as well as the standards of the spatial industry (Open GIS Consortium), the Object Oriented technology movement (Object Management Group), and of Linux - are all excluded.

We do not agree with those who argue that the problem is not significant. Appendix B provides background on one of these issues, while Appendix C argues that the use of proprietary standards in procurements appears to be the result of a policy that recognizes that the formal standards process has broken down and that proprietary offerings are as good as, if not better (in the eyes of the purchaser) than the currently mandated standardization regime.

We disagree with the defense that the current system addresses the problem, and that there is no real issue here. This is a serious and substantial issue to participants in the standardization process. The following quote, from a leading European standardization site, explains the issue succinctly:

> "To us formal ICT standardizers, sometimes consortia are a pain in the neck. We recognize they are quick, industry solutions to produce necessary specifications, which they call "standards" but we don't.
> These bodies don't always take full account of the real needs of end users, and it is difficult to find information on them and what exactly they are doing."[29]

While it can be argued that this is not the perception of ANSI, ANSI's strategic plan includes the following:

> " In successful standards processes
> - Decisions are reached through consensus among those affected.
> - Participation is open to all affected interests.
> - Balance is maintained among competing interests.
>
> …
>
> - Governments use voluntary consensus standards in regulation and procurement.
> - U.S. Government should encourage more use of the principles embodied in accreditation by recognizing the ANSI process as providing sufficient evidence that American National Standards (ANS) meet federal criteria for voluntary consensus standards;

- Non-traditional standards organizations should review their objectives to determine where closer interaction with the formal system will help add value to their efforts;"

All of these assertions, if read from the perspective of a consortium, would seem to indicate that ANSI is focused on maintaining its hegemony and expanding the use of its definition of the "voluntary standards process". It does not indicate that there is an attempt to make all standards equal; rather, the above text would seem to indicate that ANSI is attempting to position its process as superior - something that consortia frequently take strong exception to.

The role of the government - within the IT sector - should be to equalize the activities of all of the standards players, so that all legitimate interests are fairly represented in the IT arena. The next section proposes legislation to achieve this end.

SECTION V: TOWARDS AN EXPANDED DEFINITION OF A VOLUNTARY CONSENSUS STANDARDS BODY

To unify U.S. standardization activities in the IT sector, a specific amendment to the Public Law 104-113, the ``National Technology Transfer and Advancement Act of 1995" should be proposed.

1. The proposed legislation would have to contain specific language limiting the intent of this change to only the IT community (as defined in Section II).
2. It would deal only with voluntary, market driven IT standardization, and would not impact regulatory standards (such as health, safety, or the environment).
3. It would have as criteria for a "legitimate consortia" the items listed in Section III as attributes of a "good consortium".
4. It would not exclude anyone or any organization from seeking either the ANSI or the ISO imprimatur.
5. It would make exceptions to the legislation difficult to obtain.
6. It would put in place and enforce a tracking mechanism to monitor the use of non-open standards.
7. It may be appropriate to include a directive to NIST to expand the role of the National Voluntary Laboratory Accreditation Program (NVLAP) in an effort to "train the trainers" if the private sector demands consortia accreditation.

The purpose of the legislation would be to make the formal and structured informal processes equal for the voluntary, market driven IT sector and to reunify the quarreling parts of the standardization discipline to permit the continued growth of the IT sector in the United States.

APPENDIX A: THE EVOLUTION AND HISTORY OF STANDARDS SETTING ORGANIZATIONS (SSOS)

This section provides background on the differences between the various standardization organizations, why they evolved the way that they have, and reviews the strengths and limitations of each within the context of the Information Technology sector.

There are five basic variants of standards setting organizations within the IT sector[30]. Each variant has a place in the IT sector because there is no single optimal choice for development of standards for the entire industry. This section of the paper looks at these five organizational variants, and provides some history and background on all of them as they relate to the unique aspects of IT standardization.[31] ANSI is examined in particular detail, since it is the primary stakeholder for the U.S. in all formal organizations (national or international), that currently are the primary providers of specifications used in procurement in the United States.

The five types of organizations are:
- (1) Trade associations, (2) formal Standards Developing Organizations (SDOs)
- (3) Consortia, (4) Alliances
- (5) The Open Source software movement

1. Trade Associations and Standards Developing Organizations (SDOs)

These two types of organizations are linked because they both belong to the formal school of standards - that is, a standards process that is heavily focused on maintaining due process, openness of participation, and a comprehensive appeals process. As will be seen, the process that these organizations have created within the U.S. is a result of legal challenges to their work, and is absolutely necessary for the regulatory or similar arenas, where there is an implied legitimacy ascribed to a specification labeled as an official standard.

The trade association activities in standardization take the place of pride for being the oldest form of standardization activity of those listed here, dating as it does from the late 1800's. Generally, the associations were gatherings of professional men who were experts in a particular field (boilers, fire prevention, mechanical engineering). Their intent in setting up these groups was to create a professional discipline and to preserve this discipline by creating specifications embodying their wisdom for the sake of their colleagues. Hence, societies like the American Society of Mechanical Engineers (ASME), the Institute of Electrical and Electronics Engineers (IEEE), and the American Society For Testing and Materials (ASTM) came into being. In most cases, the primary mission of these groups is the education of members

in their professional discipline, with standards as a secondary activity to fulfill some of the training requirements[32]. These groups were directly responsible for technical practices that could impact public safety, and needed to ensure that their specifications were correct. Peer review was not only desirable, it was necessary and expected.

In many cases, the specifications developed by the trade organizations have become the basis for codes and statutes, and have acquired a regulatory patina that permits them to be used as defense in liability cases. By definition, if you follow the specifications published by the National Fire Protection Code, you are using techniques and practices that have been tested, tried and proven to be safe. This makes trade associations excellent for codifying successful past practices - things that are stable, structured, and time insensitive. Within the IT industry, in areas that do not touch upon, for example, safety issues, looking to past practices for future guidance is usually a prescription for failure.

It is necessary to note that the regulatory use of standardization has another and darker side. In two Supreme Court cases, American Society of Mechanical Engineers vs. Hydrolevel [33](1982) and in Allied Tube and Conduit vs. Indian Head [34](1988), the standards bodies were found to have abused their ability to impact the market. While the cases varied with respect to details, the economic power of the organization was cited as a major point of contention. In both cases, there were process violations on the part of the organization. It is the necessity to have a process - and the need to adhere to that process - which makes the association a subset of the formal process, since the formal process for developing standards, in the U.S. is created, maintained, and administered by American National Standards Institute (ANSI). The U.S. government has not created a national standards body. Instead, ANSI is the "first among equals", the rule setter, the interface to ISO and the IEC, and currently the only organization that can give the *imprimatur* of an American National Standard (ANS) to the specifications produced by most U.S. standards organizations. It does not, however, create standards. It has no expertise in the subject matter of standards; it has expertise only in the maintenance of its process.

A brief examination of the history of standardization within the U.S. is necessary to put an organization like ANSI into its proper perspective. Following the First World War, there was a national standardization initiative sponsored by Herbert Hoover to make sense of the chaotic state of standards in the U.S. Voluntary cooperation between the organizations was a goal; it was initiated in the Twenties and then stopped as the Depression began. However, following the Second World War, the initiative took off again and eventually the organization that was to become the American National Standards Institute (ANSI) came into prominence.[35] While not a governmental entity, ANSI was meant to regularize standardization in the U.S. Several serendipitous legal incidents happened to strengthen ANSI's hand (an anti-trust case, a Congressional investigation), and eventually ANSI came out as the first among equals in U.S. formal

standardization. It alone (of the myriad of standards organizations in the United States) has the right to publish standards which bear the appellation "American National Standard"; because ANSI does itself not create standards, it acts as a publishing arm for the more than 170 organizations which have sought ANSI accreditation.[36] At the same time, other nations (especially Germany, France, the U.K., and Japan) began to strengthen their nationally chartered bodies to pursue standards as a part of their national industrial policies.

A European-style national standards body makes sense in the context of the post-World War II industrial environment. Nations were trying to strengthen their individual industrial capacity; many were rebuilding after a devastating war. The creation of “standards” allowed an industrial policy that could be controlled (to varying degrees) by the nation. The U.S. chose instead to lead by encouraging the private sector to enter into standards partnerships. This allowed the trade associations to continue to act as “standards organizations”, while encouraging the formation of new organizations devoted only to standardization. Examples of this last include the Accredited Standards Committees (ASC) X3 (IT), X9 (Banking), X12 (EDI) and so on.

As national and regional economies became more interdependent, however, it was necessary to establish an international standardization authority. Following WWII, and with the growth of the internationalism, ISO was established and the IEC and ITU had more credence given them, so that there could be truly international standards. However, there is a cultural sensitivity that was overlooked at times - the concept of "international" did not necessarily mean "good" to a country, unless it was that country's specification being carried forward. And since the basis of the international formal activity was the national body, the biases of the various national bodies were brought forward. Within the IT industry, the balance of power turned to the U.S., since U.S. based IT companies were more successful than their counterparts worldwide, due in some part to the larger size and homogeneity of the U.S. market, which made economies of scale possible for U.S. firms. With the economies of scale came the ability to innovate more quickly, which in turn fed the need and use requirements of users, leading to more innovation, an increased market, and increased sales. By 1985, the U.S. dominance in IT - in market share, in intellectual property, in research and development, and in deployed base - was firmly established. Because of this market dominance, the dominance of the U.S. in formal standards was also established; a majority of IT standards were those proposed or initiated by U.S. companies, either through the U.S. standardization bodies (e.g. ASC X3 or the IEEE Computer Society) or through U.S. company representatives acting in foreign standards bodies (such as the Deutsches Institute for Normung [DIN], the German national body where U.S. subsidiaries exercised heavy influence).

In the early 1990s, the European Community began to coalesce. One of the favored methods of creating a "single European market" was to require the various nations to abandon "unique" national standards in favor of "Pan-European" (or regional) standards. By eliminating a multitude of competing and conflicting standards, a British manufacturer, for example, would not have to make multiple separate products or go through national conformance test regimes. By adhering to a single "pan-European" standardization regime, it was felt that European providers could begin to realize economies of scale, similar to those of the U.S. manufacturers. To further this purpose, the European Union recognized (or created) three Regional standards organizations - the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC), and the European Telecommunications Standards Institute (ETSI).[37] The mission for all of these groups was to "… promote voluntary technical harmonization in Europe in conjunction with worldwide bodies and its partners in Europe." [38] The key to understanding the activities of the EU is to remember that European National Body standardization activities were often a barrier to the unification of European economic activity. By requiring the unification of standards (and a common acceptance of a single standard), the EU was seeking to unify its markets and to provide for economic growth as a unified Europe.

This was not, however, the way that the activity was seen in the United States. The unfortunate appearance of ISO 9000 Quality Management series of standards in 1989 gave the impression that the Europeans were creating a "Fortress Europe" by using standards and certification schemes as non-tariff trade barriers[39]. The debate was exacerbated by the use of common standards phrases with substantially different meanings, depending upon which side of the Atlantic Ocean you lived. The involvement of ANSI - at the behest of some of its members - began a long, torturous, and losing battle to stop the pan-European standardization activity. The requirement that the European national standardization bodies must accept a CEN standard, and that CEN has a "special" relationship with ISO[40] gave rise to U.S. concerns that the vote in ISO could be rigged in favor of the Europeans, since the Europeans might vote in concert with one another.

However, the accusations by ANSI that the Europeans were block voting became (and remains) shrill[41]. While this may be necessary for national positioning, it is not helpful to the IT industry, which has a substantial international market for its products. The appearance of a " National Standards Strategy for the United States" has placed IT companies with a significant presence in European standardization bodies in an awkward position - they must either accept the concept of an overriding U.S. national position or they must be willing to dismiss the statements of an organization in which many of them are members.

At the same time, the lack of clarity within the U.S. standardization regime has made many of its counterparts in ISO uneasy with ANSI[42]. Because ANSI is only the "first among equals" in the U.S., it has no absolute mandate as the sole international representative of the U.S. at ISO. ANSI sits at ISO and the

IEC because it is the single "most representative" body on all standardization, and because it has the singular right to grant the title of an American National Standards (ANS) to a specification. This right is enforced by ensuring that those who wish to publish an ANS follow the ANSI procedures for creating standards. As noted above, ANSI has as its only contribution to standardization the process and coordination between groups. ANSI's mission statement reads "ANSI does not itself develop American National Standards (ANSs); rather it facilitates development by establishing consensus among qualified groups. The Institute ensures that its guiding principles -- consensus, due process and openness -- are followed by the more than 175 distinct entities currently accredited under one of the Federation's three methods of accreditation (organization, committee or canvass)".[43] The way that a group becomes "qualified" is to embrace ANSI's development rules - which are the "formal process rules".[44]

It is this "formal process" which is the value of the "formal organization", whether a trade association doing standards, ANSI, any of the ANSI accredited Committees, or the international organizations of ISO. The process is specified; variations are not allowed. The mantra of ANSI is:

- Decisions are reached through consensus among those affected.
- Participation is open to all affected interests.
- Balance is maintained among competing interests.
- The process is transparent — information on the process and progress is directly available.
- Due process assures that all views will be considered and that appeals are possible.

Absent any of these conditions, an organization cannot become accredited. And because their fundamental rationale for existence may not meet the ANSI conditions, consortia have always been outside of the pale of formally accepted standards.

2. Consortia and Alliances

Within the IT standardization context, consortia and alliances are collections of like-minded organizations and/or individuals who come together to act as advocates for a particular change. The desired change may be a new specification, a new way of approaching a problem, or a new research and development activity. The legal basis of the organizational style known as "consortia" or "alliance" is found in the National Cooperative Research and Production Act of 1993 (15 U.S.C. §§4301, et seq.), which has as its purpose "…to promote innovation, facilitate trade, and strengthen the competitiveness of the United States in world markets by clarifying the applicability of the rule of reason standard and establishing a procedure under which businesses may notify the Department of Justice and Federal Trade Commission of their cooperative ventures and thereby qualify for a single-damages limitation on civil antitrust liability."[45] The Act lists a lengthy series of activities which are prohibited if an organization wishes to take advantage of the Act; in

many cases, the charter of an organization specifically writes these prohibitions into their charter to make sure that participants understand the purpose of the organization is to encourage innovation and commercialization of technology (two purposes of the act.)[46]

Consortia initially were created to deal with the “clarity and time to market” problem that was seen as a major obstacle in the formal arena. Much of the problem in the formal arena lay with its arcane rules for openness and review; several of the formal review process steps required six months and could expand to even more time. The consortia, responding to the pressure of "time is money, especially when the product life cycle was shrinking", wanted a faster system. The proponents and opponents of consortia have focused on this "speed issue", not realizing that increased speed was achieved in a consortium by changing the process. The argument has never been about speed; it has been about the process needed to achieve the speed necessary to satisfy the market needs of the members of the organization.

In most of the cases, the consortia modified the traditional standardization process by formally imposing some limitation on participation. The limitation usually took the form of dues - that is, there is a requirement to "pay to play."[47] The payment could be modest or significant (from approximately $3,000 per year to the $50,000 that large corporations are often taxed.) The consortia also announced their intentions - when you have like minded companies, you can announce and drive to a solution with a greater degree of freedom than can a formal SDO, which usually has no way of controlling where its efforts will lead. Finally, a consortium does not have to be broad spectrum - that is, it can focus on and solve only those problems that it wishes to solve. There is no requirement for it to create committees to solve all problems; rather it should (by definition) be working on problems that its members need to have solved in order to produce products.

Finally, and perhaps most damaging to the formal standardization process, consortia specifications are usually turned into product offerings immediately by the participating companies. The rationale for playing (and paying) within a consortium is to create and then market a technology. To participate in a consortium (paying both dues and committing scarce human resources) and then to not implement the specification when it appears is definitely foolish and possibly irresponsible, and is the exception more than the rule. Additionally (depending upon the cohesiveness of the consortia), the specification usually has one or more implementations that validate the specification.

There are two schools of thought on when and what to standardize. One school believes that standardizing current practice - that is, abstracting an interface specification from existing products - is the preferred method, while another school of thought revolves around standardizing future technology in its predeployment phase. The "current practice school" rewards the innovator by allowing a time to market and

market share advantage, while embracing stability in the market and rapid deployment of technology. The other (future technology) permits a group design, combining the best of breed (at times), but is usually slower and can produce a specification that is filled with compromise. Both have been used successfully within consortia, but the standardization of current practice, in which the innovator opens a proprietary specification in return for a possibly transient market advantage, is usually the most preferred.[48] The classic case used to argue for "current practice standardization" is the failure of OSI (Open Systems Interconnect), which involved of standardizing technology that was not deployed and which was being created in committee. On the other hand, there is a reluctance to take a widely deployed but non-standard technology to the formal organizations, since there have been instances where formal organizations have attempted to change the technology once it arrived in their committees. When this (the changing of a deployed technology) happens, the worst of all worlds results - a standard that does not reflect installed base usage of the specification, so that one or the other is declared invalid. With either outcome, both sides lose.

Consortia are also slightly more informal in the coordination of their efforts. Unlike the formal world, where all of the players are known to one another and tracked, the consortia/alliance arena has no central clearing house or authority to coordinate activities. There are efforts made to track consortia, but new consortia appear in the IT arena at the rate of about one every other week.[49] There is nothing to prevent multiple organizations from tackling the same general topic (i.e. wireless internet communications). This is encouraged by the organizations that fund the consortia and alliances, since having multiple solutions sometimes mitigates the impact of catastrophic technical change. What the industry does not like is two Standards Setting Organizations (SSOs) solving the same problem using the same specifications (dueling specifications) or a specification being bifurcated and modified. This is where much of the concern about standardization comes in – and the old tired rubric of “The nice thing about standards is that there are so many of them” is brought up[50]. It is duplicative standards – not duplicative standardization efforts – that are the bane of the industry.

The consortia processes are rigorous, since they must comply with the provisions contained in the National Cooperative Research and Production Act of 1993, under which many of them are chartered. There is an area of expertise on the legal implications of the creation of consortia, and nearly every consortium that is created requires the services of at least one lawyer.[51] Consortia operate as strictly under their rules as formal SDOs operate under theirs. If they fail to keep their processes legitimate, they risk all of their members and their own existence. The emphasis that consortia place upon following their rules is illustrated by the fact that, as of this writing, there has never been a successful suit brought against a consortium for anti-trust activities.[52]

Consortia and alliances (their more short lived brethren) serve a need of the IT industry as a way to stabilize the market in a time of shortened product life cycles and rapid market change. By providing processes that are open, and by providing the market with multiple implementations of the consortia specification, they have increased competition and ensured that the standardization of the high technology industry can continue.

3. Open Source

Open Source is another form of standardization, and is probably the most expensive type of standardization in which an organization can engage, since participation and use of open source code may require that an organization change its fundamental licensing principles with respect to its intellectual property (IP).[53] In all of the other organizational types, the contributing organization can choose the terms and conditions of its giving, as long as the terms are reasonable and non-discriminatory. The difference is that with open source, the terms and conditions of the grant are mandated in the particular licensing agreement chosen by the group.

The reason for the allure of Open Source is contained in writings by the philosopher and activist of the Open Source movement - Eric Raymond, in the Cathedral and the Bazaar[54], and Jamie Zawinski (formerly of Netscape who convinced Netscape's management to make the source for Netscape's browser into open source and call it Mozilla). Linus Torvalds led the creation of the popular Operating System named Linux in the same philosophical frame - which is open for all to use without exception or restriction, other than the requirement to act as part of the community. The movement has caught mindshare and market share, and many large corporations are embracing the Linux phenomena, hoping later that they can find the method to profit.

The key to understanding the open source community understands the license. The licensing itself is complex; there are at least five variants:[55]:

1. No license at all (i.e., releasing software into the public domain)
2. Licenses like the BSD License that place relatively few constraints on what a developer may do (including creating proprietary versions of open source products)
3. The GNU General Public License (GPL) and variants which attempt to constrain developers from "hoarding" code, i.e., making changes to open-source products and then not contributing those changes back to the developer community, but rather attempting to keep them proprietary for commercial purposes or other reasons
4. The Artistic License, which modifies several of the more controversial aspects of the GPL

5. The Mozilla Public License (MozPL) and variants (including the Netscape Public License or NPL) which go further than the BSD and similar licenses in discouraging "software hoarding" but which still allow developers to create proprietary add-ons if they wish.

The intent of these various forms of licenses is to ensure that the code remains open for all to use, validate, modify, and improve. These license forms, more than anything else, are the core of the Open Source standards movement. They encourage the community to act together, and act as a re-enforcing mechanism for "open source behavior" (which is a larger good to which all standards organizations must subscribe). By tying their unique behavior to licensing activities, they are then freed to espouse rules that re-enforce the benefits of open source licensing – including rules on how to write code, how to publish code, how to correct code, and so on.

The good aspect of open source is that there are multiple implementations of the code - anyone who wishes may take the source code and write an implementation. The difficult aspect of Open Source is that there is never a stabilized standard set of source code to specify, since by its very nature, Open Source is a constant and incremental improvement in a code base. However, the creators and purveyors of Linux are working on this, and are attempting to create a Linux standard that will solve this problem. If this problem is solved (basically, a version control problem), then the Open Source organization will also be a viable candidate for procurement.

4. Conclusion

All of the various forms of standardization can and do serve a purpose in the IT sector. There is the need for stability (provided by the formal arena), a need for defined and structured faster change (provided by consortia and alliances) and the need for complete community involvement (provided by open source.) The groups within each arena have not learned to work together for the good of "open systems". Rather than considering proprietary and closed systems to be the force to be changed, they have dissipated their energies arguing about which form of standardization is best, forgetting that the answer is that "Standardization is best, and non-standardization is less than optimal." ANSI is a necessary, but not sufficient, standardization component for the needs of the IT sector. Consortia are central to IT standardization success - but need the stability that the formal process can offer. And for long-term change (to both the technical and legal fabric of IT sector standardization), open source is an interesting direction - and may lead to an entirely different standardization environment in the future.

Standardization is a complex discipline that is constantly changing as the industry underneath it evolves. The last decade in the IT industry have seen massive change as the very nature of information use and sharing by customers has changed. The state and changes in the IT industry in the United States reflects

the state and changes of its consumers - U.S. society, both commercial and private. The IT sector has been credited with making the U.S. economy much more productive, and this has aroused admiration throughout the world.[56] Uniting the various forms of standardization by allowing equivalency - in legal as well as in economic settings - would only enhance the industry. It is one of those rare situations that has no negative consequences to the industry or society.

APPENDIX B: AIR FORCE COMPUTER ACQUISITION CENTER RFP 251

In the mid-80's the Air Force was preparing a very large procurement for computing equipment in which it wanted to replace/upgrade its aging systems (Air Force Standard Multi-user Small Computer Requirements Contract). Specifically, it needed to get UNIX environments, but (1) there was no formal standard, and (2) there was no publicly available test suite to test that the systems procured under this contract would meet the functional requirements laid out in the RFP.

This was the time frame in which there were a multitude of UNIX variants that could not necessarily interoperate. Most were based on either BSD, developed at Cal Berkeley or Unix System III developed by Bell Labs Unix Development Laboratory. It was crucial that this procurement not result in yet more non-interoperable systems. At the time, AT&T Bell Labs had heavily invested in Unix as the steward of what was in essence a precursor open source development effort where hundreds of universities and other research facilities had helped to collaboratively evolve the Unix specification.

The Air Force, after close examination of the alternatives, decided to require that systems bid for its procurement (AFCAC 251) must conform to AT&T's SVID (System V Interface Definition), where it cited specific publicly available texts that contained the specification.

At the time, AT&T also provided a Conformance Test Suite to test conformance of an implementation to the SVID. This test suite, SVVS (System V Validation Suite) was only available from AT&T. AFCAC 251 required passing the SVVS as a condition of the procurement.

When this RFP was released, a formal protest was filed by a number of companies objecting that this procurement was not based on a formal standard, but on a proprietary, copyrighted specification. Further, and more importantly, it was claimed that the SVVS could not be used because it was the proprietary property of a potential bidder. The resulting protest was very high profile, lengthy, and very costly for all parties involved. In addition it resulted in significant delays to a critical federal procurement.

AFCAC 251 was the impetus for the proposal, and adoption, of Federal Information Processing Standard (FIPS) 151. FIPS 151 was based on the then maturing work of the IEEE Computer Society's POSIX standards committee. POSIX was an operating system specification standard based on the Unix specification provided in the SVID. Further, the National Bureau of Standards (NBS, now NIST) prevailed in establishing a test methods working group for POSIX that developed the POSIX Test Methods standard. This standard was used, along with the SVVS donated by AT&T, as the basis for the development of FIPS 151 PCTS (POSIX Conformance Test Suite) by NIST with the assistance of experts from a number of IT companies and organizations under a Cooperative Research And Development Agreement (CRADA). NIST then established an accredited POSIX test laboratory program and required the use of the PCTS in the certification of conformance of an operating system to FIPS 151.

So, how does this support the need for clearer rules for the use of Consortia standards as equals to formal standards?

Today, the leading edge evolution of most critical IT technologies is occurring in consortia, not in formal Standards Developing Organizations (SDOs). The government will be able to obtain the best information technology by requiring conformance to these consortia specifications. In the case of AFCAC 251 this would have resulted in the savings of many millions of dollars that was spent by the government and the protesting companies in defending/pursuing the AFCAC 251 procurement protest. In addition, the systems needed by the Air Force would have been obtained in a much more timely manner.

APPENDIX C: DISA's use of FIPS certification

One element of DISA's Defense Information Infrastructure Common Operating Environment (DII COE) is the identification of processor and OS platforms and software that will form the foundation of the COE, also called the DII COE Kernel. DISA's customer needs (DISA's customers are the CINCs, services and agencies within DoD) has resulted in DISA maintaining three platforms as "COE compliant" including Solaris, HP-UX and Window NT/2000.

Responding to vendor assertions that they were being denied access to programs that required COE compliance, yet had no way to achieve that compliance (DISA, for cost reasons, would not undertake the effort, and there was no way for the vendor to do the work themselves), DISA established the Kernel Platform Certification (KPC) program.

The program requires four main items for acquiring a DII COE Kernel compliance certificate. These include:

- Providing a FIPS 151-2 certificate of Posix compliance
- Completing several test suites out of the UNIX98 branding suite maintained by the Open Group
- Successful porting of the COE "kernel code" to the candidate platform, and completion of a series of test suites that verify proper operation.
- Passing a security checklist that is roughly equivalent to commercial grade security (e.g. passwords for all accounts, access controls, etc.).

DISA has indicated that they expect the three platforms that they currently maintain in the COE will be kept COE compliant by their respective owners using the KPC program. The issues with the KPC are two-fold. The first is that the KPC program addresses only Posix-compliant platforms. Windows NT and 2000 are not subject to its requirements, and DISA maintains that Windows OS "compliance" is essentially satisfied with a pointer to Microsoft documentation.

The second issue, which is more relevant to the standards availability theme, is that the lack of an alternative to the now withdrawn FIPS 151-2 has forced DISA to continue to use that obsoleted standard. DISA had investigated simply pointing to UNIX branding maintained by The Open Group, but this ran into an interesting problem. Other vendors successfully objected to this approach because The Open Group method of implementing Unix98 branding requires an ongoing commitment and subscription to the program with TOG. This apparently violates an acquisition law that prohibits the government from requiring vendors enter into long term, third party agreements in order to do business with the government.

The current solution, which DISA negotiated with The Open Group, is to specify a subset of the specific test suites desired by DISA, and which The Open Group will offer up to vendors on a modified basis that eliminates the long-term commitment. The FIPS 151-2 specification is still used, but is expected to be replaced by the Austin group's specification within the next 6-12 months.

[1] The Economist Newspaper, 23 February, 1993

[2] An open standard is a standard which is not under the control of a single vendor and which is easily available to those who need it to make products or services.

[3] While the NIST usage referred to technologies which are the basis of standards, today's Internet and web standards are becoming the infratechnology upon which e-Business, e-Commerce, and all of the other "e-" activities are being built.

[4] Leech, David P.; Link, Albert N.; Scott, John T.; Reed, Leon S.; NIST Report: 98-2 Planning Report The Economics of a Technology-Based Service Sector, January 1998, TASC, Inc. Arlington VA., p. ES-8 (http://www.nist.gov/director/prog-ofc/report98-2.pdf)

[5] Libicki, Martin C. Scaffolding the New Web: Standards and Standards Policy for the Digital Economy, RAND, Santa Monica, CA, p. xi (http://www.rand.org/publications/MR/MR1215/)

[6] These were the ANSI accredited standards committees called Accredited Standards Committee (ASC) X3 and Accredited Organization (AO) IEEE (Computer Systems). Approximately 85% of the key standards were created in X3, including storage interconnect, languages, and so on. The IEEE dealt with physical interconnects (such as local area networks) and eventually moved in to software interfaces.

[7] In 1996, X/Open was merged with the Open Software Foundation to create The Open Group. X/Open was originally created in Europe to embrace and extend UNIX ® to limit the spread of U.S. companies into the European IT arena. After ten years of existence, and before its merger, it was largely dominated by major U.S. IT providers, with Siemens as its sole surviving European member.

[8] Cargill, Carl F. Information Technology Standardization,: Theory, Process, and Organizations, Digital Press, Bedford, MA, 1989, p. 117.

[9] The reason that consortia are often more visible within a company that are formal organizations is that consortia are more directly tied to the product success of a company. A company will join a consortium to promote the creation of a specification that it needs for market reasons - there is an imperative behind the consortia's creation. The same imperative is not necessarily found in formal organizations.

[10] The IETF describes itself in the following way: The Internet Engineering Task Force (IETF) is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. It is open to any interested individual. The actual technical work of the IETF is done in its working groups, which are organized by topic into several areas (e.g., routing, transport, security, etc.). Much of the work is handled via mailing lists. The IETF holds meetings three times per year. The IETF working groups are grouped into areas, and managed by Area Directors, or ADs. The ADs are members of the Internet Engineering Steering Group (IESG). Providing architectural oversight is the Internet Architecture Board, (IAB). The IAB also adjudicates appeals when someone complains that the IESG has failed. The IAB and IESG are chartered by the Internet Society (ISOC) for these purposes. The General Area Director also serves as the chair of the IESG and of the IETF, and is an ex-officio member of the IAB. See http://www.ietf.org

[11] See http://www.w3.org/Consortium/ for a detailed description of both the creation of the underlying vision of the Web by Tim Berners-Lee and the initiation of the W3C by MIT, INRIA, and Keio University.

[12] In the case of HTML 3.2 (a specification developed and promulgated by W3C), ISO/IEC JTC1 SC18 (the committee charged with standardization of this technology) tried to standardize HTML 3.2 with "JTC1 improvements", but only after W3C had standardized HTML 3.2, the users had implemented it in millions of Web sites. After serious negotiations by W3C and major users and providers, SC 18 agreed not to make their standard different from the W3C standard, which was in widespread use.

[13] The Economist Newspaper, "The Age Of The Cloud, Survey Of Software", Special Supplement, Apri14-20th, 2001, 111 West 57th Street, New York, NY 10019-2211

[14] Spring and Weiss discuss the problems of private sector funding of the formal standards organization in their article in *Financing the Standards Development Process* pp. 289-320, in Standards Policy for Information Infrastructure, edited by Kahin, Brian and Abate, Janet, MIT Press, 1995.

[15] Weiss, Martin and Carl Cargill. "Consortia in the Standards Development Process" *Journal of the American Society for Information Science 43(8) (1992)*:559-565

[16] Updegrove, Andrew, *Consortia and the Role of the Government in Standard Setting*, pp. 321-348, in Standards Policy for Information Infrastructure, edited by Kahin, Brian and Abate, Janet, MIT Press, 1995,

[17] Ketchell, John, at The CEN/ISSS web site, http://www.cenorm.be/isss/Consortia/Surveyshort.htm

[18] Updegrove, op. cit. , p. 327.

[19] The rationale for this list of attributes derives from conversations with staff members of the House of Representatives Sub-Committee On Technology, Environment, and Standards, Daniel Weitzner of W3C, Stephen Oksala (Vice President, Society of Cable Telecommunications Engineers), Oliver Smoot (Chairman of the Board, ANSI), Dr. Mark Hurwitz (President, ANSI), Dr. D. Linda Garcia (Georgetown University), and others on how to describe a "good consortium". It is based upon experience (both good and bad) of the participants in many discussions, but especially to those in the W3C Patent Policy Working Group.

[20] Updegrove, op.cit., p. 338

[21] Ibid., p. 338

[22] ISO rules state: If the proposal is accepted on technical grounds, the originator shall ask any holder of such identified patent rights for a statement that the holder would be willing to negotiate worldwide licences under his rights with applicants throughout the world on reasonable and non-discriminatory terms and conditions. Such negotiations are left to the parties concerned and are performed outside the ISO or IEC. A record of the right holder's statement shall be placed in the registry of the ISO Central Secretariat or IEC Central Office as appropriate, and shall be referred to in the introduction to the relevant International Standard (see item *e)* below). If the right holder does not provide such a statement, the technical committee or sub-committee concerned shall not proceed with inclusion of an item covered by a patent right in the International Standard without authorization from ISO Council or IEC Council as appropriate. ISO/IEC Directives, Part 2, 1992 (as amended) [Annex A, A.2, b)] http://isotc.iso.ch/livelink/livelink/fetch/2000/2123/SDS_WEB/sds_ipr.htm

[23] The criteria here are a combination of the requirements of the IETF (running code and dual, competing implementations) and the testing regime of the UNIX ® specification, run by The Open Group. The purpose of the conformance testing regime is to ensure that organizations claiming conformance to the specification actually do conform. However, it must be noted that the requirement for testing is contentious, as providers in the IT sector tend to favor "self testing and self certification" to testing provided by third parties. Allowance should be made to allow the consortium members the right to determine what level of testing they want; at the same time, the market, which on occasion has demanded third party testing, will be the ultimate arbitrator of the decision.

[24]U.S. Congress, Global Standards, op.cit., p. 14, footnote 23

[25] PL 104-113 is an act to amend the Stevenson-Wydler Technology Innovation Act of 1980, Public Law 96-480.

[26] OMB Circular A-119; Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities AGENCY: Office of Management and Budget, EOP.

ACTION: Final Revision of Circular A-119.

[27] "Balance of interest" is a term referring to the need to have equivalent interests (vendor, user, and others) have equal representation in an organization or in a development committee. As noted, a consortium is composed of those interested enough in a technology to commit resources (usually financial) with the hope of receiving a return on their investment, usually in the form of a specification that can be employed in some form of commerce.

[28] Ibid.

[29] web site, http://www.cenorm.be/isss/Consortia/Surveyshort.htm

[30] The concept of sectoral approach in standardization is presented in ANSI's National Standards Strategy for the United States, Section V, (http://www.ansi.org/Public/nss.html)

[31] A significant difference of the IT sector with other sectors is that, within the IT industry, we are, in the main, speaking of voluntary market driven standards, which are left to the discretion of the provider to supply. It is important to note that the majority of unique IT sector standards are interface standards describing a particular systems interface. They do NOT deal with safety or environmental activities. They are optional in a product - depending upon the business model of the vendor. Standards of this type are (and will continue to be) one of the costs of doing business, just as is translation of instruction manuals into a native language.

[32] The ASTM seems to have completely morphed into a standardization organization, and, while it maintains a "Yellow page listing" of consultants and expert witnesses, it doesn't seem to be educating testing experts. The mission statement of the ASTM reads: " To be the foremost developer and provider of voluntary consensus standards, related technical information, and services having internationally recognized quality and applicability…" With a complete yearly set of ASTM standards costing nearly $7000, and with ASTM standards being cited in legislation, one can understand why the ASTM has moved entirely to standardization activities. (http://www.astm.org/NEWS/Mission2.html)

[33] http://www.antitrustcases.com/summaries/456us556.html

[34] http://www.antitrustcases.com/summaries/486us492.html

[35] From ANSI's web site, their description of themselves: The American National Standards Institute (ANSI) has served in its capacity as administrator and coordinator of the United States private sector voluntary standardization system for more than 80 years. Founded in 1918 by five engineering societies and three government agencies, the Institute remains a private, nonprofit membership organization supported by a diverse constituency of private and public sector organizations. (http://www.ansi.org/public/ansi_info/intro.html)

[36] The Institute ensures that its guiding principles -- consensus, due process and openness -- are followed by the more than 175 distinct entities currently accredited under one of the Federation's three methods of accreditation (organization, committee or canvass). (http://www.ansi.org/public/ansi_info/national.html)

[37] Web sites are: www.cenom.be, www.cenelec.org, and www.etsi.org..

[38] Between 1983 and 1989, the EU began to focus on its internal market and the plethora of standards available within Europe. As a result, the "Council Resolution of 7 May 1985 on a New Approach to technical harmonization and standards" was passed in 1985, establishing the principles of European standardization. The essential outcome of all of these activities was to gain a "…national commitment [that] formal adoption of European Standards is decided by a weighted majority vote of all CEN National Members and is binding on all of them" (http://www.cenorm.be/aboutcen/whatis/objectives.htm).

[39] ISO 9000 is an entirely problematic standard. It was originally started as a U.S. Air Force standard in the 1960s, adopted by the British in the 1970s, and then sent to ISO in the 1980s. It is a "management standard", which means that it doesn't tell you "how to do quality", but rather "how to manage a quality program, including the necessary paperwork and records retention". The appearance of this standard and

its rapid acceptance and "mandatory use" (including third party certification) in many European companies and government procurements left a bitter legacy with U.S. companies who were "forced" to comply with third party testing.

[40] See the "CEN Constitution and Organization" at http://www.cenorm.be/boss/co000.htm#b1 for the complete text, recognizing the Vienna Treaty and the common European norms.

[41] At a presentation at the American Academy for the Advancement of Science (17 February 2001, San Francisco), ANSI President and CEO Mark Hurwitz stated that he believed that the Europeans engaged in block voting to stop U.S. SDO initiatives. From a national point of view, this has significance; from an international point of view (that normally taken by multinational companies), the existence of a standard that is meant to satisfy a large potential market (325 million people) is of substantial interest and is worth investigating and possibly implementing.

[42] See the U.S. Congress, Office of Technology Assessment, *Global Standards: Building Blocks for the Future, TCT-512* (Washington, D.C.: U.S. Government Printing Office, March 1992), pp. 13-14 for a view of the U.S. standardization process which haunts the U.S. to this day in Europe.

[43] From ANSI Online, ANSI's web site, cite: http://www.ansi.org/public/ansi_info/national.html

[44] It is interesting to note that both major international standardization organizations - ISO and the IEC - have, within the last four years, adopted processes to recognize "Industry Technical Agreements" (ITAs), which allow any organization as "open" to progress a common industry practice through a lightweight process to achieve the appellation of either an ISO or IEC ITA. The senior organizations have recognized the need within their primary markets for a quicker and faster way to gain widespread recognition of a specification that is widely accepted, but possibly does not need the rigor of their full process. See http://www.iec.ch/ita-e.htm for a description of the IEC program, and http://www.iso.ch/presse/ita.htm for a description of the program at ISO.

[45] http://caselaw.lp.findlaw.com/casecode/uscodes/15/chapters/69/sections/section_4301.html

[46] A typical statement, taken from the proposed sponsor agreement of one consortium, is " Nothing in this Agreement shall be construed to require or permit conduct that violates any applicable Antitrust Law. A Sponsoring Member consents to the disclosure of its name as a member of the Corporation, for the purpose of permitting the Corporation to invoke the protection of the National Cooperative Research and Production Act of 1993 (15 U.S.C. §§4301, et seq.), if the Corporation decides to invoke such protection."

[47] It has been argued by several members of consortia that the travel and meeting requirements of formal organizations constitute a membership limitation, as very few private citizens have the ability to travel to all of the meetings of an international technical committee where the technology is decided. Some of the consortia with Internet based processes claim that their consortia dues are less than a participant would pay in travel costs.

[48] The business case behind this type of decision is usually very complex and filled with enough vagaries to make the prediction of success purely Brownian. Normally, it comes down to a senior executive being willing to take a chance and go forward with opening a technology to the market.

[49] The IT sectoral organization under CEN (CEN/ISSS) undertakes to maintain a list and description of consortia. It currently lists/links to approximately 260 consortia working in the areas of IT, either publishing specifications or specifying requirements. It is available at: http://www.cenorm.be/isss/Consortia/Surveyshort.htm

[50] This statement amplifies the contention that there is a lack of education about standards and standardization.

[51] See Updegrove, Andrew; "Standard Setting and Consortium Structures", StandardView (Volume 3, Number 4): December 1995 for a discussion of the nature of the rules that apply when establishing a consortium.

[52] The closest successful suit was the Addamax anti-trust suit that was lost and lost again on appeal. (United States Court of Appeals For the First Circuit No. 97-1807, Addamax Corporation, Plaintiff, Appellant, V. Open Software Foundation, Inc., Digital Equipment Corporation, and Hewlett-Packard Company, Inc, Defendants, appellees, Appeal From The United States District Court For The District Of Massachusetts).

[53] The most popular types of licenses (Mozilla, GPL, and Berkeley) do not require that the owner of IP to give up the rights to their IP> Rather, these licenses require that the owner of the intellectual property grant broad, perpetual, and non-restrictive rights to use the IP, in effect making all of the users equal. The broad nature of the grant - in which the IP owner reserves few or no rights - is what has given many the impression that open source can be equated with forfeiting IP rights.

[54] Available at http://www.tuxedo.org/~esr/writings/cathedral-bazaar/

[55] Hecker, Frank “Setting Up Shop: The Business of Open-Source Software”, 6 December 1999, Revision 0.7 DRAFT, http://www.hecker.org/writings/setting-up-shop.html

[56] "Despite the relatively modest share of ICT [Information and Commu nication Technologies] manufacturing in total U.S. production - 8% of total - the remarkable acceleration of productivity in that specific sector has contributed a disproportionately high 0.6% a year to total U.S. labour productivity growth." From "Europe in the e-Economy - Challenges for Enterprises and Policy-maker", Patrick Vittet-Philippe (Expert Advisor, DG Enterprise, European Commission), p.2